Example Problem

Given:

Inflow hydrograph

K = 2.3 hr, X = 0.15, Δt = 1 hour, Initial Q = 90 cfs

Find:

Outflow hydrograph using Muskingum routing method

$$C_1 = \frac{\Delta t - 2KX}{2K(1-X) + \Delta t} = \frac{1 - 2*2.3*0.15}{2*2.3(1-0.15)+1} = 0.0631$$

$$C_2 = \frac{\Delta t + 2KX}{2K(1-X) + \Delta t} = \frac{1 + 2*2.3*0.15}{2*2.3(1-0.15)+1} = 0.3442$$

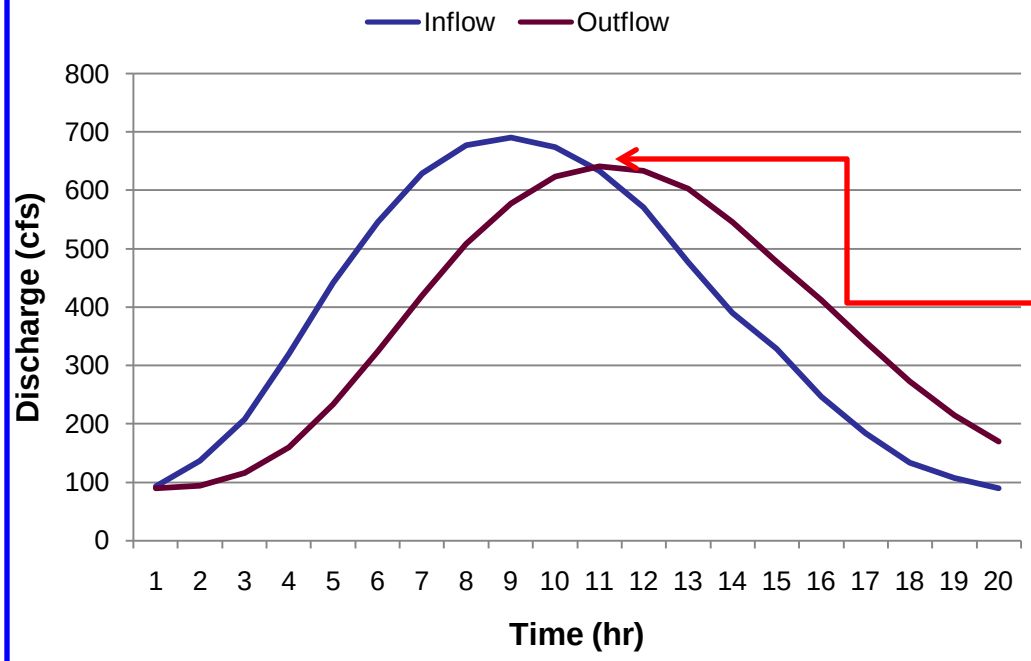
$$C_3 = \frac{2K(1-X) - \Delta t}{2K(1-X) + \Delta t} = \frac{2*2.3*(1-0.15)-1}{2*2.3(1-0.15)+1} = 0.5927$$

Period (hr)	Inflow (cfs)
1	93
2	137
3	208
4	320
5	442
6	546
7	630
8	678
9	691
10	675
11	634
12	571
13	477
14	390
15	329
16	247
17	184
18	134
19	108
20	90

Example Problem Contd…

$$Q_{j+1} = C_1 I_{j+1} + C_2 I_j + C_3 Q_j$$

$C_1 = 0.0631, C_2 = 0.3442, C_3 = 0.5927$



Period (hr)	Inflow (cfs)	$C_1 I_{j+1}$	$C_2 I_j$	$C_3 Q_j$	Outflow (cfs)
1	93	0	0	0	90
2	137	9	32	53.343	94.343
3	208	13	47	55.9171	115.9171
4	320	20	72	68.70406	160.7041
5	442	28	110	95.2493	233.2493
6	546	34	152	138.2469	324.2469
7	630	40	188	192.1811	420.1811
8	678	43	217	249.0413	509.0413
9	691	44	233	301.7088	578.7088
10	675	43	238	343.0007	624.0007
11	634	40	232	369.8452	641.8452
12	571	36	218	380.4217	634.4217
13	477	30	197	376.0217	603.0217
14	390	25	164	357.411	546.411
15	329	21	134	323.8578	478.8578
16	247	16	113	283.819	412.819
17	184	12	85	244.6778	341.6778
18	134	8	63	202.5124	273.5124
19	108	7	46	162.1108	215.1108
20	90	6	37	127.4962	170.4962

Exercise Problem

An inflow hydrograph is measured for a cross section of a stream. Compute the outflow hydrograph at a point five miles downstream using the Muskinghum method . Assuming K = 12hr, x=0.15, and outflow equals inflow initially. Plot the inflow and outflow hydrograph.

Time	Inflow (cfs)
9:00A.M.	50
3:00P.M	75
9:00 P.M.	150
3:00A.M.	450
9:00A.M.	1000
3:00P.M.	840
9:00P.M.	750
3:00A.M.	600
9:00A.M.	300
3:00P.M.	100
9:00P.M.	50